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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/656,182	09/08/2003	Allen McTeer	M4065.0248/P248-C	8422

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EXAMINER

LEE, EUGENE

ART UNIT	PAPER NUMBER
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2815

DATE MAILED: 03/23/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/656,182

Applicant(s) ☒

MCTEER, ALLEN

Examiner

Eugene Lee

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 30 December 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 74-83 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 74 is/are allowed.
- 6) ☒ Claim(s) 79-83 is/are rejected.
- 7) ☒ Claim(s) 75-78 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- ☒ Notice of References Cited (PTO-892)
- ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____
- ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- ☐ Notice of Informal Patent Application (PTO-152)
- ☐ Other: _____

DETAILED ACTION

Claim Objections

1. Claims 75 thru 78 are objected to because of the following informalities: in line 1 of claim 75, it appears "Figure 74" should be "Claim 74"; in line 1 of claim 76, it appears "Figure 74" should be "Claim 74"; in line 1 of claim 77, it appears "Figure 76" should be "Claim 76"; and in line 1 of claim 78, it appears "Figure 74" should be "Claim 74". Appropriate corrections are required.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

3. Claims 79, 80, and 83 are rejected under 35 U.S.C. 102(e) as being anticipated by Chopra et al. 6,613,671 B1.

The applied reference has a common assignee with the instant application. Based upon the earlier effective U.S. filing date of the reference, it constitutes prior art under 35 U.S.C.

102(e). This rejection under 35 U.S.C. 102(e) might be overcome either by a showing under 37 CFR 1.132 that any invention disclosed but not claimed in the reference was derived from the inventor of this application and is thus not the invention "by another," or by an appropriate showing under 37 CFR 1.131.

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Chopra discloses (see, for example, Fig 3) an interconnect structure comprising a metal-comprising layer (conductive bond pad) 14, metal-comprising layer 16, and an intermetallic material (titanium-aluminum-copper-nitrogen layer) 18. In column 3, lines 18-19, Chopra discloses the metal-comprising layer 14 comprising copper. In column 3, lines 46-51, Chopra discloses the metal-comprising layer 16 comprising aluminum, titanium, and metal combinations listed above. In column 4, lines 15-21 and column 2, lines 1-10, Chopra discloses that the intermetallic material comprises the first and second metals of layers 14, 16. In column 7, lines 63-66, Chopra discloses that metal-comprising layer 14 has nitrogen.

Regarding claim 80, see, for example, column 3, lines 18-19, wherein Chopra discloses the metal-comprising layer 14 comprising copper.

Regarding claim 83, see, for example, column 3, lines 46-51, wherein Chopra discloses a metal-comprising layer (electrical conductor) 16.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 81, and 82 rejected under 35 U.S.C. 103(a) as being obvious over Chopra et al. 6,613,671 as applied to claims 79, 80, and 83 above, and further in view of Jang et al. 6,423,625 B1.

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The applied reference has a common assignee with the instant application. Based upon the earlier effective U.S. filing date of the reference, it constitutes prior art only under 35 U.S.C. 102(e). This rejection under 35 U.S.C. 103(a) might be overcome by: (1) a showing under 37 CFR 1.132 that any invention disclosed but not claimed in the reference was derived from the inventor of this application and is thus not an invention "by another"; (2) a showing of a date of invention for the claimed subject matter of the application which corresponds to subject matter disclosed but not claimed in the reference, prior to the effective U.S. filing date of the reference under 37 CFR 1.131; or (3) an oath or declaration under 37 CFR 1.130 stating that the application and reference are currently owned by the same party and that the inventor named in the application is the prior inventor under 35 U.S.C. 104, together with a terminal disclaimer in accordance with 37 CFR 1.321(c). For applications filed on or after November 29, 1999, this rejection might also be overcome by showing that the subject matter of the reference and the claimed invention were, at the time the invention was made, owned by the same person or subject to an obligation of assignment to the same person. See MPEP § 706.02(l)(1) and § 706.02(l)(2).

Chopra in view of Jang does not disclose said copper layer containing a thin copper oxide layer thereon. However, Jang discloses (see, for example, column 1, lines 30-33) a copper passivated by copper oxides. Jang further discloses that the copper oxides make Cu less vulnerable to chemical corrosion. Therefore it would have been obvious to one of ordinary skill in the art at the time of invention to have said copper layer containing a thin copper oxide layer thereon in order to passivate the metal-comprising layer and make it less vulnerable to chemical corrosion.

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Regarding claim 82, Chopra in view of Jang does not disclose said copper oxide layer having a thickness not greater than 300 Angstroms. However, it was well within the skills of an artisan in the art to optimize the performance of a semiconductor device by adjusting the thickness of a copper oxide layer in order to adequately protect an underlying layer. Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention was made to have said copper oxide layer having a thickness not greater than 300 Angstroms because it was well within the skills of an artisan to optimize the performance of a semiconductor device by adjusting the thickness of a copper layer in order to adequately protect an underlying layer. See *In re Aller*, 105 USPQ 233.

Allowable Subject Matter

6. Claim 74 is allowed.

7. The following is a statement of reasons for the indication of allowable subject matter:

The references of record, either singularly or in combination, do not teach or suggest at least a copper bond pad for a semiconductor device; said bond pad comprising: a dielectric layer formed over a substrate of said semiconductor device; a barrier layer formed over said dielectric layer; a copper layer formed over said barrier layer, said copper layer having an upper surface implanted with titanium, said copper layer having a thickness of about 500 Angstroms to about 20,000 Angstroms.

Response to Arguments

8. Applicant's arguments with respect to claims 74-83 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

INFORMATION ON HOW TO CONTACT THE USPTO

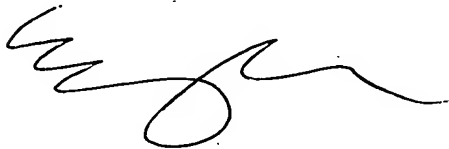
Any inquiry concerning this communication or earlier communications from the examiner should be directed to Eugene Lee whose telephone number is 571-272-1733. The examiner can normally be reached on M-F 8-5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tom Thomas can be reached on 571-272-1664. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Eugene Lee
March 18, 2005

A handwritten signature in black ink, appearing to be 'Eugene Lee', with a stylized, cursive script.